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ABSTRACT

Eight basic components of instructional programs for severely handicapped students are discussed. Components are seen to involve determination of content, rationale, method, materials, measurement and student performance. Emphasized is the need for a task analysis orientation to determine content and for developmentally sound longitudinal curriculum to justify teaching a specific skill. An eclectic approach to questions of methodology is advocated, basic principles of instructional measurement are reviewed, and the importance of students' rate of response is considered. Use of functional and nonfunctional tasks is one topic covered in a discussion of materials. A skill is said to be generalized when it is performed across persons, places, instructional materials, and language cues. The list of components concludes with the importance of arranging for students to be able to perform the task without directions to do so from an authority fugure. (CL)

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BASIC COMPONENTS OF INSTRUCTIONAL PROGRAMS FOR SEVERELY HANDICAPPED STUDENTS

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Basic Components of Instructional Programs For Severely Handicapped Students

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Severely handicapped students (Sontag, Burke & York, 1973) are often different from many "normal" and "mildly handicapped" students on a variety of relevant instructional dimensions (e.g., generalization, retention, imitation, articulation, acquisition, vision skills). Due to such differences the premise offered is that the teacher of these students must systematically delineate, compensate for the absence of, or directly teach skills that teachers of less handicapped students may assume are operative.

For the past several years the writers and their colleagues have been attempting to formulate and implement developmentally tenable and empirically verifiable educational services for severely handicapped students in the Madison, Wisconsin, Public School System. One of the vehicles determined of substantial educational value from both training

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and service perspectives is the organization of circumscribed teacher-pupil interactions into instructional programs. The term instructional program, as it is used here, refers to basic factors, variables, etc., that a teacher of severely handicapped students must consider, systematize, and/or implement in order to teach a particular skill.

Brown and York (1974) delineated a four component model of an instructional program: What to teach (content); how to teach (method); how does one assess whether or not one has taught (measurement); and the instructional materials required.

Using the four component model of an instructional program delineated above, severely handicapped students have been taught many developmentally important, practically useful, yet circumscribed skills (Brown, Bellamy & Sontag, 1971; Brown & Sontag, 1972; Brown, Scheuerman, Cartwright & York, 1973; Brown, Williams & Crowner, 1974). However, as should be obvious, adherence to the four component model may be necessary, but is not sufficient to provide the best possible instructional services in that several crucial factors related to the acquisition and performance of specific skills are not taken into account. Thus, the four component instructional program has been expanded substantially and is presented below:

Basic Components of an Instructional Program

I. What skill does a teacher intend for the student to perform (What does a teacher intend to teach the student)?

II. Why does a teacher want the student to perform a specific skill?

III. How does a teacher intend to teach the student to perform a skill?

IV. How can a teacher empirically verify that the skill of concern is being or has been taught?

V. Can the student perform the skill at a situationally acceptable rate?

VI. What does a teacher intend to use as vehicles (instructional materials) for the skill to be acquired and performed?

VII. Can the student perform the skill across:

a. Persons;

b. Places;

c. Instructional materials;

d. Language cues?

VIII. Can the student perform a skill without directions to do so from persons in authority?

Before proceeding to a more detailed presentation of each component, several points should be noted and emphasized. First, space does not permit as detailed a presentation of each component as is possible. Second, there is no doubt that the list of components

delineated above is incomplete and that additional components will evolve. Third, we are recommending that a teacher of severely handicapped students empirically verify the acceptable status of his/her students on dimensions of at least the components delineated above.

In the narrative that follows an attempt will be made to elucidate the basic qualitites of each component, justify their inclusion, show how they might be realized, and provide teachers with practical suggestions as to how the requisite skills inherent in each might be incorporated into instructional activities.

I. What skill does a teacher intend for the student to perform?

One of the more crucial differences between teaching normal or mildly handicapped students and severely handicapped students is the degree of precision required when presenting instructional content (Brown & York, 1974). Teachers of severely handicapped students must be afforded the experiences and skills necessary to systematically dissect, sequence, redissect, resequence, etc., skills under instruction. In our judgment, the conceptual and problem attack skills required and fostered by a task analysis orientation are ideally suited for teachers of severely handicapped students.

A teacher may be interested in teaching a value, an appreciation, an attitude, a skill, a concept, an understanding, a subtlety, or a feeling. Certainly, such initially nebulous objectives can be taught to severely handicapped studnets. However, the position offered here is that such objectives probably can be realized more efficiently if they

can be operationalized in such a manner as to clearly indicate to the teacher and to the student precisely what is requested and when it should be manifested. It is a rare severely handicapped student indeed who can make large leaps through poorly organized and unspecific curriculum content. On the other hand it has been our experience that all students can acquire new skills if those skills are dissected and sequenced precisely.

Task analysis essentially requires the precise delineation of skills within a particular curriculum area, the division of those skills into component parts, and the sequencing of those skills from easy to hard (simple to complex). According to Resnick, Wang and Kaplan (1974) task analysis involves:

> "the develop(ment of) hierarchies of learning objectives such that mastery of objectives lower in the hierarchy (simpler tasks) facilitates learning of higher objectives (more complex tasks) . . . This involves a process of task analysis in which specific behavioral components are identified and prerequisites for each of these determined (p. 680)."

Perhaps the major purpose of analyzing skills inherent in a curriculum content area is to delineate an organized and precisely stated constellation of verifiable objectives from which a variety of instructional activities can be generated. A task analysis is not a statement of <u>how</u> a skill is to be taught but rather a statement of <u>what</u> is to be taught. A precise delineation of <u>what</u> is to be tuaght is an obvious prerequisite to the determination of the required materials, teaching,

measurement procedures, etc.

Notions as to what skills should be included in a particular content area and how such skills might be analyzed and sequenced can be obtained or abstracted from at least the following:

a. General child development literature

b. General cognitive development literature

c. General special education literature

d. Commercially available curriculum packages

e. Logical post-school performance demands

It has been our experience that teachers of severely handicapped students can rarely use, without substantial adaptation, commercially available instructional content. Thus, from a training perspective perhaps it is more appropriate to provide a teacher with skills and experiences in the area of task analysis so that in subsequent practical situations that teacher can adapt other or create new analyses to fit the developmental functioning level of his/her students.

There are at least three major reasons why teachers of severely handicapped students should be skilled in the use of basic principles of task analysis. First, a task analysis delineates starting points and terminal objectives and enhances the possibility that essential component skills will not be neglected. Second, utilization of task analysis procedures facilitates instruction that is tailored to individual functioning levels. For example, within the task analysis model mastery of various objectives can be assessed before instruction and students may only be instructed on objectives on which they failed to reach and

for which they have mastered the prerequisites. In addition, students can be permitted to proceed through the sequence at their own pace, taking longer on trouble spots and skipping objectives on which they demonstrate mastery. Third, the utilization of task analysis procedures facilitates the development of more effective and efficient classroom programming. That is, a teacher can obtain data from students concerning the order in which skills are most readily acquired and skills that must be broken into smaller subskills in order to facilitate acquisition. This information can be used to continually improve instructional programs.

II. Why does a teacher want the student to perform a specific skill?

Generally, longitudinal educational objectives for severely handicapped students should be no different than those for other students. Public schools should prepare severely handicapped students to function as independently as possible socially, vocationally, and personally in the least restricting post school environment. In our view, there is no justification for preparing students to function in large residential institutions or to foster or maintain the development of environments that unduly shelter, restrict, or retard.

Perhaps due to the limited educational opportunities in the past and the almost inevitable placement of severely handicapped citizens in large residential institutions, it might have been acceptable to teach them to "walk the line," "make pot holders," "watch Jack LaLane" without much concern for why such skills were taught. Now, however, severely

handicapped students will be enrolled in public school programs for as long as 21 years. Longitudinal public education coupled with the goals of the deinstitutionalization and child advocacy movements force us to ask and justify why we should teach any specific skill. It is our current view that instruction of a skill should be justified primarily as a cumulative segment of a developmentally sound longitudinal curriculum sequence.

Well defined skill sequences across curricula domains (e.g., math, reading, language, play, self-help, independent community functioning) may be utilized to precisely delineate functioning levels within each domain. Placement of an individual along dimensions within skill sequences provides the teacher with vital information concerning the skills the individual has mastered, those that remain untaught, and in what order they might be presented. In addition, utilization of developmental skill sequences might minimize the potentially deleterious effects of changes in teachers and administrators on longitudinal programming. Obviously, a precise deleneation of the current functioning level of a student on a variety of educationally important dimensions is more relevant to the development of viable instrucitonal services than the use of such descriptions as autistic, severely retarded, trainable, psychotic, emotionally disturbed, and low MA.

Finally, while the provision of longitudinal developmental services is a goal to which we all must strive, we have an extremely long way to go before realization. There are persons around the country who have developed relatively good preschool or postschool programs, others have

developed reasonable public school age programs, others have developed notable parent training activites, others have potentially valuable research projects in operation, etc. To our knowledge there is no place in which all the needed longitudinal service components are operating to such an extent that the development of large numbers of citizens over long periods of time is maximized. Certainly, we still need to develop isolated bits of information, certainly extraordinary case study achievements will continue to be inspirational; but these and other such delimited endeavors rarely provide substantial changes in the life styles of many severely handicapped citizens.

III. How does a teacher intend to teach the student to perform a skill?

There is no doubt that teachers can formulate logically defensible longitudinal curriculum sequences and ingenious clusters of apparently relevant task analyses. However, if a teacher cannot teach students to perform the skills required by the sequences and analyses, then all is for naught. The procedures, techniques, tactics, stragegies, etc. teachers use to reach new skills may be referred to as the how of instruction. Without a technology of how; what to teach is rhetoric.

Arriving at an empirically tenable system of how to teach new skills to severely handicapped students is one of the most crucial challenges confronting the educator. Particularly since delineating an appropriate how to teach is almost always confounded with varying degrees of visual, auditory motor, attending, etc. impairments.

Precise and replicable statements as to how to teach new skills are unfortunately quite rare. What may be an effective procedure for teaching one student or one group of students, may be inappropriate for another student or group. In addition, even such apparently precise techniques as operant conditioning, discrimination training,and behavior modification are probably arts (Bricker, 1970).

Statements as to how to teach severely handicapped students have emanated from and will continue to emanate from many sources: electrical and mechanical engineering, human development, special education, psychology, teacher and parent ingenuity, the history of education, what grandmothers once did to name but a few. In an attempt to be eclectic and practical and still be relevant to the problems of severely handicapped students, we have organized information from a variety of sources into what may be referred to as basic principles of acquisition and performance. Many of the terms used to describe these principles have been taken from literature related to operant and respondent conditioning, discrimination learning, observational learning, concept development, imitation learning and behavior modification. However, it should be emphasized that these principles, techniques, tactics, etc. must be adapted or converted for classroom use; that many schools of thought describe the same event with different words; and that the principles available for systematic utilization now are not sufficient for the educational community to provide the best possible services.[2]

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[2]A more detailed listing of basic principles of acquisition and performance and appropriate references are available upon request.

IV. How can a teacher empirically verify that the skill of concern is being, or has been taught?

Some teachers do not even attempt to systematically assess any aspect of student progress; some teachers attempt to record every response every student makes every minute the students are in school; some teachers use one particular measurement system to the exclusion of all others. The position offered here is that teachers should have the skills necessary to implement a variety of measurement designs and techniques in such a manner as to foster a smoothly flowing instructional environment, yet in a manner that also allows the systematic recording and empirical verification of crucial aspects of student development.

There can be little doubt that direct measurement of the developmental progress of severely handicapped students is a vital aspect of any instructional system. Perhaps the following two passages are appropriate here:

> In any empirical definition of teaching, instructional measurement is crucial. With normal and mildly handicapped students, inferences about populations of skills made from samples and inferences about generalization of skills across persons and places and materials are probably necessary and tenable. Unfortunately, inferential measurement, in our judgment, is an extremely questionable measurement orientation when applied to most severely handicapped students. The general rule that we try to follow may be stated as follows: If you determine that a particular response, skill, concept, etc.,

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> is important to the development of the student, then it is incumbent upon the teacher to directly measure the existence of the response, skill, concept, etc. of concern (Brown and York, 1974, p. 9).

> Direct measurement is particularly crucial in attempts to teach cumulative tasks. If the correct performance of the responses in component c of a task are dependent upon the correct performance of the responses in components a and b, then the teacher must guarantee that a and b responses are in the behavioral repertoire of the student before she even considers progression to component c. Since most developmental skills are in many ways cumulative (mathematics, reading, language, speech, practical arts), teachers of trainable-level retarded students must be prepared to spend relatively long periods of time and considerable effort developing basic behavioral repertoires (Brown, 1973, p. 110-111).

It should be noted and emphasized that in addition to competencies related to how to empirically verify (measure) student progress, teachers should also be exposed to rationales regarding why and when to measure and to a variety of approaches toward measurement.

The following is a selected listing of measurement issues, terms, designs, assumptions, tactics, etc. to which our teachers in training are exposed. It should be noted that most of the designs listed below are what may be referred to as "subjects as their own controls designs." However, in addition to the listings below, teachers in training, as

part of their general preparation, also receive information regarding parametric and nonparametric statistical manipulations, intergroup designs, standardized tests, etc.[3]

Basic Principles of Instructional Measurement

1. Subjective - Objective
2. Dependent Variable
3. Independent Variable
4. Intra-group Measurement Designs
5. Inter-group Measurement Designs
6. Correlated Designs (AB Design)
7. ABAB Designs
8. Test-Teach-Test Designs
9. Multiple Baseline Designs
10. Trials to Criterion Designs
11. Direct Measurement
12. Inferential Statistics
13. Cumulative Frequency Designs
14. Reliability
15. Correlation
16. Criterion Referenced Tests
17. Rate of Response
18. Intensity of Response
19. Frequency of a Response
20. Latency of a Response
21. Duration of a Response
22. Errors to Criterion
23. Population
24. Continuous Measurement
25. Parameter
26. Sample
27. Statistic
28. Descriptive Statistics

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[3] A more complete listing and appropriate references are available upon request.

V. Can the student perform a skill at a situationally acceptable rate?

Rate is a term which typically refers to the number of times a particular response occurs in a given time period. In an academic setting where often times a skill is a composite of different responses, the view of rate can be extended to include the number of times all critical components of a skill are performed in a given time period. There is no doubt that severely handicapped students have deficiencies in the rates at which they perform particular responses or clusters of responses. There are times when severely handicapped students manifest rates of responding that are too high. For example, a normal student might hit himself in the head once a week, a severely handicapped student might hit himself in the head five times per minute for months. A somewhat similar but different rate deficiency also manifested is the inordinate amount of time many students require to progress through a series of cumulative responses. If students have acquired a skill and performed it correctly a specified number of times, it does not necessarily indicate that the skill is mastered. In order for a skill to be considered mastered, that skill should be performed correctly at a relevant rate criterion (proficiency).

There are at least three reasons for including rate of correct responding as a component of skill mastery. First, if students are to compete with and be tolerated by other individuals in the community, they will have to perform skills at community acceptable rates. For example, assume that a student has been taught to make change and then the student is asked to go to a grocery store and purchase the items on

a grocery list. In a situation that actually occurred, one of our students secured the items on the list, computed the total cost of the items, and then counted out the appropriate amount of money required to pay for the goods. Unfortunately, the counting of the money required almost five minutes. Thus, a situation can exist where a student could accurately perform a given series of responses, but the time required for the performance may not be acceptable in a community setting.

Second, if a skill requires the utilization of a number of responses in sequence, a slow rate of responding may interfere with the performance of all components in the sequence by increasing the probability that the student may be unable to recall certain components. For example, assume a teacher gives a student a three component direction to follow. If the student takes twenty minutes to perform the first response, there is a good chance that she/he may not remember the cues for the last two responses.

Third, if one accepts the premise that a skill should be not only performed correctly, but performed at an acceptable rate criterion, then a question remains regarding when a rate criterion should be imposed upon skills that are cumulative. Because of a paucity of research in the application of a rate criterion in educational settings, a teacher faced with this question seems to have two major options. Assuming skills A, B and C are cumulative, a teacher may choose to require the student to: perform A at a proficient rate before moving on to B; next perform both A and B (i.e., in combination) at a proficient rate before moving on to C; and finally, perform A, B and C at a proficient rate

before terminating instruction. A second option would be to require the student to perform A, B and C correctly. Once acquired, a rate criterion would be imposed upon the combined skill (A, B and C) in order to achieve an acceptable level of proficiency.

VI. What Does the Teacher Intend to Use as Vehicles for the Skill to be Acquired and Performed?

Tasks and task materials are vehicles through which skills are taught. Obviously, choosing tasks and task materials should not be made in a hasty, arbitrary, or nebulous manner. Teachers should carefully design and/or choose tasks and materials that reflect a consideration of the unique problems presented by the students of concern. As one of the primary goals of teaching severely handicapped students is the eventual performance of skills acquired in controlled instructional settings in other more practical environmental settings, many tasks should be chosen for their functional use across environments.

Functional tasks can serve the dual purposes of concretizing abstract concepts which may increase meaningfulness (Zeaman, 1973) and of teaching practical skills that students may be able to utilize daily across many environments. For example, one-to-one correspondence skills (aligning members of two sets in an arrangement which manifests a one-to-one relationship between the members) may be taught through the aligning of blocks and bears, putting straws in cups, giving each classmate a cookie, or giving each place setting a cup, plate, spoon and fork when preparing for lunch. The latter two examples teach the skill while

stressing function in applied settings; the former two simply require performance of the skill. The meaningfulness and utility that functional tasks can add to the instruction of a skill argue strongly for their use when designing instructional programs for severely handicapped students.

Not all skills can be taught exclusively through functional tasks and materials. The types of tasks needed to teach many visual discriminations to severely handicapped students highlight this point. When teaching a visual discrimination skill the task chosen should make the essential stimulus characteristics (e.g., form, color, size) easy to discern. Although this point appears simple to apply it has ramifications which, if not considered when structuring tasks, unfortunately may lead to the development of differential responding to nonessential stimulus characteristics. For example, assume a teacher wants to teach a student to discriminate the letter "A" from the letter "B." In an attempt to make the differences between the two letters easy to discern, the teacher then presents a red upper case "A" and a blue uppercase "B." In this situation the teacher may find that the student has learned that red is called "A" and blue is called "B."

A fundamental discrimination learning rule related to selecting tasks with which to teach concepts is to choose tasks which will insure that responding is controlled only by the essential characteristics of the concept. In the letter recognition discrimination task mentioned above, this rule requires that the task should be designed so that responding is controlled by the form of the letters, not by color, size,

texture or spatial position, etc. When using a functional task, control over nonessential or irrelevant characteristics is often difficult to achieve. For example, if one of the tasks used to teach letter discrimination is labelling the letters in the words "men" and "women" as they appear on the doors of public restrooms, a multiplicity of scripts, colors and placements would probably be encountered which might impede acquisition of the skill. In such situations, nonfunctional tasks which make the essential stimulus characteristics easy to discern and concommitantly reduce nonessential stimulus characteristics should probably be employed initially. Once the skill is acquired, however, essential and nonessential stimulus dimensions could then be varied or introduced.

When relating to this issue Becker, Engelmann and Thomas (1971) suggest that to insure that essential stimulus characteristics control responding, instructional tasks should be chosen which allow the teacher to:

1. Teach a concept through a set of instances and not instances of the concept (e.g., examples of the letter "A" and examples that are not of the letter "A").
2. Construct instances of a concept such that they all have essential concept characteristics, and construct not instances having none or only some of the essential characteristics.
3. Frequently vary nonessential characteristics of instances and not instances to insure that responding is only to essential characteristics (e.g., when teaching the letter "A", the size, color, texture and position of instances and not instances of the letter should be varied).

Implicit in the above three suggestions is the assumption that students are attending to variations in essential and nonessential characteristics of the stimuli presented. Often it is not enough to simply expect that consistent manipulation of the stimuli will be both necessary and sufficient conditions to produce the differential responses of concern. In some instances having students verbally label stimulus dimensions (nonverbal students might use gestures) and stimulus choices may facilitate differential responding to essential stimulus characteristics, and also increase retention of correct responses through the development of mediators (Butterfield, Wambold and Belmont, 1973; Borkowski & Wanschura, 1974; Bricker, 1972; Jeffrey, 1953; Jeffrey, 1958; Chatelanal, Henderson, Robinson & Bricker, 1971; Zeaman, 1973; Zimmerman & Rosenthal, 1974).

Other situations in which a teacher might choose to supplement functional with nonfunctional tasks might be those that require repeated practice for the acquisition of a skill, since many functional tasks typically permit only one or two response opportunities for only a few students per day. It is probably not efficient though to simply employ a task because it permits repeated practice of a particular skill in that boredom and inattention which can compete with academic progress are many times end products of stereotypic repetition.

Whether a task is functional or not, teachers should attempt to utilize tasks and materials that have reinforcement value. Choosing tasks on the basis of their reinforcement value involves selecting tasks and materials with which students will readily interact, preferably in free play situations. (A free play situation is referred to here as one

where the task is available, but the student is neither prompted to engage in it nor externally reinforced for engagements.) On many occasions teaching skills through tasks with reinforcement value may involve teaching skills through toys, games, music and songs (i.e., sight words may be taught through potentially dull flashcard drills or through potentially more interesting sight word games).

If it is necessary to teach skills for which few functional tasks can be readily devised, then games, toys, music and songs which require the performance of the skills may enable the teacher to add an intrinsically reinforcing functional component while at the same time increasing the probability that maintenance through repeated practice in other environmental settings will occur after instruction. That is, games, toys, music and songs which require the performance of skills may be used to augment academic programming and as recreational activities to provide additional practice of skills in a variety of environmental settings.

Some criteria for selecting potentially reinforcing tasks are: a) tasks should be novel or offer results that are not always predictable; b) tasks should be matched to functioning levels. Tasks which are either too easy or too sophisticated are not appropriate. However, tasks just above current functioning level should hold interest and pace development; and c) tasks should allow active engagement and manifest cause and effect relationships (Piaget, 1952).

There are at least three major advantages to teaching skills through tasks with reinforcement value: 1) skills may be reinforced by

allowing continued performance of the task and/or interaction with the task materials instead of relying upon teacher delineated reinforcers; 2) students are more likely to interact with the task materials and thus perform the skills taught through them outside controlled instructional situations; and 3) there should be an increased probability that students will visually and/or aurally attend to intrinsically reinforcing tasks and task materials, thus possibly eliminating the need to systematically teach attending -- a necessary prerequisite to most teaching situations.

There are two additional factors which should be considered when delimiting the types and characteristics of functional tasks. First, a task that may initially appear functional may not actually be so for particular students who live in environments where there are few or no opportunities to perform related skills. Setting a table is a functional task through which one-to-one correspondence skills can be taught. However, if students live in an environment where they are not and may never be required to set a table, the task will not have functional value. Thus, teachers should attempt to insure that tasks are chosen that adequately represent the options that students have available in the environment in which they live or might live in the future. Second, tasks should be chosen on the basis of their facilitation of later skill development. This involves teaching tasks that will become components of higher level skills in a developmental sequence. Teaching students to count fingers as a rational counting task may not have much utility when rational counting is taught, but should have great utility when

addition is taught.

In summary, when a teacher is considering what to use as vehicles for skills to be acquired and performed by severely handicapped students, tasks and task materials should be chosen on at least the basis of their: a) functional use to the individual student; b) ease of discrimination; c) accessibility to repeated practice; d) reinforcement value; e) facilitation of skill maintenance; f) accessibility or frequency of occurrence across settings the individual inhabits; and g) facilitation of later skill development. As it is unlikely that many tasks will fulfill all the criteria delineated, it is often necessary to teach a skill through many different tasks and materials.

VII. Can the student perform the skill across persons, places, instructional materials and language cues?

A stimulus generalization paradigm may be used to conceptualize selected aspects of severely handicapped students' failure to perform skills acquired in one teaching environment in other environmental configurations.[4] The summarization of laboratory research studies concerned with stimulus generalization, contained in Mostofsky (1965) suggests that a given response must be taught with the teaching environment in a specifled state or configuration. After a response has been taught, variations in some well controlled aspect of the initial teaching

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[4]As used here environmental configurations include language cues, persons, places and instructional materials.

environment can be introduced and the presence of the response in the new environmental configuration can be measured. Research findings related to stimulus generalization suggest that if dramatic departures from the initial teaching environment are arranged, performance in the changed environment will probably be substantially different from performance in the initial teaching environment. However, if the changed environment is only slightly different from the initial teaching environment, performance in the changed environment will probably differ slightly if at all from performance in the initial teaching environment.

The gradation of responding observed when the performance of a response is assessed in environmental configurations slightly or dramatically different from the configuration in which the original instruction took place is known as a generalization gradient. Sidman (1960) states that, "The generalization gradient provides a mechanism whereby behavior can adapt to an environment that never exactly repeats any combination of 'stimuli.' If a successful form of behavior were to come under the control of the precise circumstances that were present at the time it was acquired, we should have to relearn the behavior each time the original situation reoccurred with its inevitable variations (p. 207)." In the following paragraphs attempts will be made to describe how a stimulus generalization paradigm may be used to conceptualize generalization across instructional materials, extraneous stimuli and relevant cues to respond.

Performance Across Instructional Materials

Assume that a student in a public school classroom has been taught to touch a ball when the teacher presents a small dark blue ball, a small dark blue cup and the verbal language cue, "Touch the ball." If the teacher then dramatically changes the task by presenting a large brown medicine ball three feet in diameter, a small dark blue cup and the language cue, "Touch the ball," it is relatively unlikely that the student will manifest better than a chance level of correct responding. However, if the teacher only slightly changes the initial instructional materials by presenting a small light blue ball, a small dark blue cup and the verbal language cue, "Touch the ball," it is likely that the student will consistently respond correctly to the new instructional material. To summarize, if dimensions of instructional materials are changed slightly, students tend to maintain responding or generalize across materials. On the other hand, if stimulus dimensions are changed dramatically, students tend to respond differentially or discriminate.

Performance Across Extraneous Stimuli

Extraneous stimuli, as the phrase is used here, are stimuli in the environment which are not intended to control a specified response. That is, touching a ball in response to a verbal language cue should not be a function of the size of the room, the color of the teacher's hair, the chair in which a student sits or the position of the objects on the table. However, it is possible that some extraneous features of an initial teaching environment can acquire response controlling properties.

If a teacher does not allow for such a possibility, she may mistakenly conject that failure to perform across environmental configurations is solely a function of, for example, the student not attending to the form cues of the ball and the cup referred to above. In fact, however, failure to perform may be a function of dramatic changes in the chair, the table, the room, the color of the teacher's hair, or the position of the objects on the table.

Performance Across Relevant Cues to Respond

A relevant cue to respond is referred to here as a stimulus or stimulus cluster which is intended to control the response a student is to perform. In a classroom for severely handicapped students cues to respond are usually presented by a teacher or contained in instructional materials. However, such stimuli as school bells and the time on clocks also function as cues to respond.

Cues to respond typically have at least a verb component which indicates the action the student is to perform (e.g., touch, take, give, pick up) and a noun component which indicates the object of the action (e.g., touch the ball, pick up the paper). Cues to respond which have action and object components do not have to be verbal in nature: a stare by a teacher may be a cue for the student to "Sit down on a chair;" a deaf educator may use hand signals to cue a student to "Touch a ball." These cues are nonverbal but nevertheless contain action and object components. In addition, it should be noted that slight variations in the physical topography of nonverbal cues to respond may not

result in differential performance. However, it is likely that dramatic variations in nonverbal cues to respond will result in differential performance. Concommitantly, when the cue to respond is verbal, slight variations in the way words are articulated will probably effect performance minimally, while dramatic articulation changes will probably effect performance significantly.

In a stimulus generalization paradigm a student is required to make topographically similar responses despite variations in dimensions of the instructional materials and extraneous stimulus constellations. Performance across different verbal language cues certainly may be conceptualized within the framework of a stumulus generalization paradigm. However, performance across different verbal language cues requires additional discrimination training to generate differential performance to the different verbal language cues.

More specifically, a teacher can issue a series of different verbal language cues to respond and the appropriate responses to the different language cues could be topographically dissimilar. For example, a teacher could present the student with a slightly different colored ball and cup on each trial and rotate the cues, "Give me the ball;" "Touch the ball;" "Point to the ball;" and "Take the ball." The student would have to respond in a topographically dissimilar way to each different verbal language cue in order to respond correctly. In this situation the stimulus generalization paradigm applies in that dimensions of the instructional materials were varied such that the student was required to respond to a slightly different instructional material on each pre-

sentation of the noun component of the verbal language cues. However, in order for the student to respond correctly it was also necessary for the student to discriminate the different verb components of the various response cues and differentially respond to those cues.

In addition, however, a teacher can issue a series of different verbal language cues to respond and the appropriate responses across the different language cues could be topographically similar. For example, a teacher could say, "Pick up many," or "Pick up several," or "Pick up a lot," or "Pick up a bunch," and the student could respond similarly and correctly to all the different language cues.

Obviously, certain verbal language cues may present unique problems when attempting to teach a student to perform a skill across environmental configurations because the student may be required to respond differentially to components of the cues. For instance, assume that in an initial teaching environment a teacher taught 'Tom' to touch the ball when presented with a small blue ball and a cup; a large red ball and a pillow; a small brown ball and a potato, etc. and then proudly announces to Tom's mother that he now can indicate what a ball is when given a verbal language cue. That night, Tom's mother places a small blue ball and a cup in front of Tom and says, "Give me the ball" ad Tom fails to give the ball to his mother. If it can be assumed that Tom did not fail due to changes in the instructional materials or because he responded to extraeous stimuli in the home environment, the reason for failue may be due to the change in the verbal language cues used. If the reasons Tom failed are related to the verbal language cue issued by his mother, then

at least two hypotheses seem tenable: First, Tom may not have responded differentially and independently to the specific verb and noun components of the language cues in the school and home environments. That is, he may have responded to only the noun components of the language cues and therefore did not differentially respond to the different verb components. Second, Tom may have responded differentially and independently to the specific verb and noun components of the verbal language cues but did not know what action to perform to the "Give" component.

The implication for educational programming is that to teach a student to perform a skill across environmental configurations the student must be taught to appropriately respond to common variations in verbal language cues, extraneous stimuli, and task materials that frequently occur across environmental configurations.

If the success of a program is to be assessed in terms of student performance of skills across environmental configurations, then the objective for each major skill taught in a program should include student performance of skills across such selected environments. For example, the instructional objective for a one-to-one correspondence skill might be: Given the language cues "Give each ____ a _____," "Give every _____ a _____," or "Put a (____) in each (_____)" by at least three different control figures (e.g., teacher, mother, peer) across at least three settings (e.g., classroom, playground, home) and across at least three functional tasks (e.g., setting the table, passing out cookies, dealing cards) the student should perform the skill.

Potentially, there are many instructional strategies which could be employed to insure that student master objectives. Perhaps the following strategy may be reasonably efficacious. If students are to perform the skills across functional tasks, then teach the skill through a combination of functional tasks and nonfuctional tasks which fulfill the task selection requirements previously delineated. For instance, teach the students one-to-one correspondence through such tasks as passing out juice cups and giving each bear a block. If the students are to perform the skills across settings, then it may be advantageous to teach the skills in several settings. For instance, teaching might occur in the gym, on the playground, in the hall, in the bathroom, and in the kitchen area using tasks appropriate to those areas. If it is necessary that students perform skills under the direction of several control figures, then several control figures may be used in instruction. If the students will likely encounter varied language cues to respond, then instruction should include cues to respond which frequently occur.

Many educators evaluate instructional program efficacy in terms of how quickly students advance through the steps of a task analysis or curriculum sequence. However, efficacy should also be assessed in terms of whether the students can perform skills across persons, places, instructional materials and language cues. Insuring that students can perform skills across environmental configurations in many instances may slow the students' advancement through the steps of a curriculum sequence. To account for this, educators will have to incorporate measures of both rate of advancement through a curriculum sequence and performance of

skills across environmental configurations into their evaluation of program efficacy.

VIII. Can a student perform a skill without directions to do so from persons in authority?

Individuals labeled severely handicapped are often referred to as externally controlled. That is, persons in authority usually tell them what skills to perform; how and when to perform the skills; if they perform the skills correctly or incorrectly; if they perform the skills incorrectly how to rectify the errors, etc. While responding appropriately to specific cues provided by persons in authority is the responsibility of all adults, there are situations in which performance is crucial but in which persons in authority are not present. In such situations it appears that severely handicapped students are particularly deficient and therefore quite vulnerable. One way to compensate for such a deficit is to teach specific skills, and then insure that those skills can be performed appropriately across environmental configurations without specific verbal cues being provided by persons in authority. Perhaps the following will elucidate.

There are situations in which it is appropriate for individuals to make a specific response to a specific cue provided by a person in authority (e.g., following a list of verbal directions; recording the food order of a customer in a restaurant). There is little doubt that severely handicapped students can acquire such skills and that such skills have enormous functional value. However, in these situations

persons in authority are continuously providing the relevant cues to respond. Obviously, such cue-response relationships are appropriate in some situations, but extremely inappropriate in others in that extraordinary dependence upon the cues of others in authority is fostered, and persons in authority are in effect determining all responses.

There are also situations in which it is appropriate for individuals to make a series of responses to only one cue provided by a person in authority (e.g., "Change the tire;" "Make the salad;" "Start working;" "Clean the tables"). There is little doubt that severely handicapped students can acquire such skills and that such skills also have enormous functional value. However, here also persons in authority are providing at least the initial cues to respond and the problems delineated above may be attendant.

Undoubtedly there are thousands of situations in adult hood which require responding specifically to verbal or other cues provided by persons in authority. However, there are also situations which require that adults engage in a response or series of responses in the absence of cues to respond provided by persons in authority (e.g., when a person is presented with a burning sofa; when a person is alone and cuts a finger; when a person is lonely or lost; when shopping for food or clothing). If a person responds appropriately when persons in authority are not providing specific cues to respond, that person may be construed as manifesting self-initiated performance skills. Obviously self-initiated performance skills are crucial to the independent functioning of severely handicapped students.

Finally, there are situations which require that a person engage in a series of responses, evaluate the correctness of the responses, and, if necessary, correct mistakes without being verbally cued by an authority figure. For example, if a person is confronted with a burning sofa, he/she might smother it with a throw rug, check to see if it is still smoking, and if necessary, pour water on it.

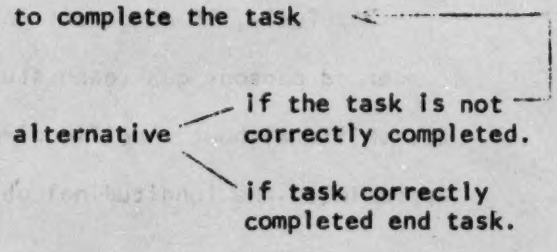
It has been our experience that many classroom activities designed for severely handicapped students have not included manipulations that allowed the students to: a) perform skills in the absence of cues provided by persons in authority; and b) evaluate and, if necessary, correct errors.

Thus, we are suggesting here that teachers determine if it is appropriate for a particular skill to be performed without specific cues to do so provided by persons in authority. If so, teachers should arrange for such performance. In addition, if it is appropriate that a student perform a series of responses, evaluate the responses, and if necessary, correct errors, then teachers should also arrange for such performance.

In the recent past the writers and their colleagues have made attempts to teach severely handicapped students the skills necessary to initiate responses or a series of responses, to evaluate the correctness of the responses made, and if necessary, to correct errors with few if any cues provided by persons in authority. Such skills are referred to here as self-regulation skills. Nietupski and Williams (1974) conceived

of rudimentary self-regulation skills as consisting of at least four basic steps:

1. Detecting or defining the task.
2. Arriving at alternative ways to complete the task
3. Implementing an alternative.
4. Assessing the outcome of the alternative



In the Nietupski and Williams (1974) paradigm students may fail to self-regulate responding because: a) they do not self-regulate steps in the self-regulation strategy; b) they fail to detect or define the task; c) they fail to arrive at an appropriate way to complete the task; d) they fail to implement an appropriate alternative; or e) they fail to evaluate the outcome correctly.

It is suggested here that self-regulation may be incorporated into a curriculum for severely handicapped students as follows: When a skill is taught, if practical, the students should be required to initiate all components of the self-regulation strategy to complete tasks related to that skill without verbal cueing from persons in authority. For example, if students are acquiring skills related to cooking, they should be required to initiate the preparation of their own meals without verbal cueing from authority figures. Stated another way, whenever a new skill is taught the students should be required to complete tasks related to the skill, generate alternative ways of completing the task, implement an alternative, and check the appropriateness of the alternative imple-

mented. Self-regulation strategies should not be taught as segmented or isolated curriculum entities but as integral parts of all activities in which students participate.

Hopefully, if educators in conjunction with parents and other concerned persons can teach students to perform situationally appropriate skills without specific direction to do so, we will more closely approximate the longitudinal objective of independent adult functioning.

Summary

Several basic components of instructional programs for severely handicapped students were delineated and described. Obviously, each component is in need of further elaboration and refinement and methods of incorporating them into longitudinal curriculum sequences must be operationalized. The possibility exists that adherence to all components when attempting to teach all skills might be impractical and irrelevant. However, it has been our unfortunate experience to observe students fail because we did not systematically consider and accommodate to relevant instructional variables. Perhaps if teachers absorb at least the components delineated into their educational services, the general skill repertoires of the students in their charge will be enhanced substantially.

In addition, it should be noted and emphasized that there is no doubt that the version of an instructional program offered here will evolve into a different form in the future. Some components will probably be rejected, some will be expanded, and others will be added.

Hopefully, what happens to this version will be a function of increased awareness of the students we are attempting to serve.

Finally, teaching technologies and other information related to the provision of the best possible educational services to severely handicapped students are in the initial stages of development. On the other hand, educators throughout the nation are being asked, ordered, or voluntarily striving to provide educational services to such students. When such an information/service gap exists, frustrations and failures are inevitable. Hopefully, through the collective efforts of many persons from many orientations and disciplines we will be able to demonstrate in the near future that comprehensive, longitudinal, and quality educational services can be generated and those services will result in substantial developmental changes in the functioning levels and ultimate life styles of citizens who at least for the moment, are referred to as severely handicapped.

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[5]The reader interested in securing information concerning the materials, references, curriculum sequences, etc. referred to in this paper is encouraged to write Dr. Lou Brown, 427 Education Building, University of Wisconsin, Madison, Wisconsin 53706. Some materials will be sent free of charge. If there is a charge, the reader will be referred to the appropriate vendor.

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